Climate Mitigation and Waste management in the EU - Geert Van Calster[*]

1. Introduction and topic selection.

This chapter reviews the EU's waste management regime as it applies in the specific context of climate mitigation. I have exercised my academic and practice experience in waste management to select, among the rather extensive amount of European Union waste laws,[1] those with in my view the most immediate impact on climate mitigation issues. However especially given the pervasive nature of climate change in EU environmental law, any selection may of course show one or two gaps.[2]

It is not only the omnipresent nature of climate change in EU environmental law which explains a role for waste management in the climate debate. Technical parameters, too, suggest a strong link between waste management and climate change mitigation. The regulation of waste landfills is the most obvious example in this regard. In particular, reduction of biodegradable waste from landfill (in favour of fermentation or composting), reduces methane emissions.

The obvious technical link between waste management and climate change, led to a 2001 study by AEA Technology, for the European Commission. The study[3] looked at municipal solid waste management 'only'. Overall, this study found that

> *source-segregation of various waste components from MSW, followed by recycling or composting or AD of putrescibles offers the lowest net flux of greenhouse gases under assumed baseline conditions. Improved gas management at landfills can do much to reduce the greenhouse gas flux from the landfilling of bulk MSW, but this option remains essentially an 'end of pipe' solution. Incineration with energy recovery (especially as CHP) provides a net saving in greenhouse gas emissions from bulk MSW incineration, but the robustness of this option depends crucially on the energy source replaced. MBT offers significant advantages over landfilling of bulk MSW or contaminated putrescible wastes in terms of net greenhouse gas flux.*[4]

with

- 'AD standing for 'Anaerobic Digestion' which produces a compost residue from source-segregated putrescible wastes for use in agriculture or horticulture. The waste is digested in sealed vessels under air-less (anaerobic) conditions, during which a methane-rich biogas is produced. The biogas is collected and used as a fuel for electricity generation or CHP;[5] and

---

[*] Professor and Head of the Department of International and EU law, KU Leuven, Belgium. www.gavclaw.com

[1] See Geert VAN CALSTER, *Handbook of EU waste law*, Richmond Law & Tax Publishers, 2006, 156p.; second edition forthcoming with Oxford University Press, 2014. See also Geert VAN CALSTER, Wim VANDENBERGHE, chapter 'Waste' in *Law of the European Union*, Oxford University Press, loosleaf: David VAUGHAN and Aidan ROBERSTON eds. Pavlos ELEFTHERIADIS Managing ed., 2008, 220p.; thoroughly revised and updated version by Geert VAN CALSTER, Raluca RADU, Thomas DE ROMPH, November 2013, 282p.

[2] In particular *not* included is the life-cycle analysis of the climate impact of waste management activities, including energy use during transport etc.

[3] *Waste management options and climate change*, AEA Technology, July 2001, 224p. available via http://ec.europa.eu/environment/waste/studies/pdf/climate_change.pdf , or http://goo.gl/A7RQoK last consulted 21 November 2013.

[4] Ibidem, p.11 (nr 20).

[5] Ibidem, p.6.

- 'MBT' standing for 'Mechanical biological treatment'. Bulk MSW, or residual wastes enriched in putrescible materials after the removal of dry recyclables, is subjected to a prolonged composting or digestion process which reduces the biodegradable materials to an inert, stabilised compost residue. The compost, which cannot be used in agriculture or horticulture because of its poor quality, is then landfilled. The treatment results in a significant reduction in methane forming potential of the compost in the landfill compared with untreated waste. Metals are recovered for recycling during the MBT process. Some of the paper and plastics in the incoming waste are diverted from the MBT process. These rejects are sent for either direct landfilling or incineration.[6]

The 2001 study already indicated hesitation vis-a-vis unqualified support for incineration of waste,[7] an issue which I revisit later in the chapter.

One ounce of prevention is worth a pound of cure, of course, which has not escaped the European Commission's ('EC') attention, either. Whence the EC has now firmly played the card of sustainable materials management,[8] and of the EU as a resources society (the latter with co-inciding issues under international trade law[9]). As these developments do not strictly relate to waste management (other than in the sense of prevention of waste), they will not be further reviewed here.

2. The landfill of waste

Avoided landfill emissions count as one of the most important means to address the climate impact of waste management.[10] The 2008 Waste Framework Directive[11] was intended to simplify European waste legislation and therefore is of relevance for all kinds of waste and related topics. This is no different for landfill. In the Directive's Recital (at 29), Member States are urged not to support the landfill of recyclable material. This is based of course on the waste hierarchy defined in Article 4(1) of Directive 2008/98, with disposal being the bottom option. Annex I of that Waste Framework Directive defines fifteen kinds of disposal operations. Two of them concern landfilling activities, namely: D1 ' Deposit into or on to land (e.g. landfill, etc.)' and D5 'Specially engineered landfill (e.g. placement into lined discrete cells which are capped and isolated from one another and the environment, etc.).

Both disposal operations have in common that they make use of landfills to dispose waste. The Landfill of Waste Directive of 26 April 1999 includes further detail.[12] After lenghty discussion, Directive 1999/31 finally entered into force on 16 July 1999. Member

[6] Ibidem, p.5.
[7] See also e.g. the 2006 study by Ecologic for the German Environment Agency, on the topic: available at http://www.ecologic.eu/download/projekte/200-249/201-38/201-38_zusammenfassung_endfassung.pdf , or http://goo.gl/flGRKh last consulted 21 November 2013.
[8] See G. VAN CALSTER, 'Opportunities and pitfalls for sustainable materials management in EU waste law', Special issue of Revue des Sciences humaines, éthique et société, forthcoming (2013).
[9] See also G. VAN CALSTER, 'China, Minerals Export, Raw Materials and Rare Earth Materials: A perfect storm for World Trade Organisation Dispute Settlement', *RECIEL* 2013, 117-122.
[10] See also UNEP, *Waste and Climate Change*, 2010, available at http://www.unep.or.jp/ietc/Publications/spc/Waste&ClimateChange/Waste&ClimateChange.pdf or http://goo.gl/nBa6aE last consulted 22 November 2013.
[11] OJ [1998] L312/3.
[12] Directive 1999/31 on the landfill of waste [1999] OJ L182/1.

States had to implement the Directive by 16 July 2001.[13] Since then, the Directive has been amended twice.[14] The Directive establishes varying duties for three classes of landfills, which were maintained in the final text: those for hazardous, non-hazardous, and inert wastes.[15] These duties include in particular the types of waste that may be accepted in the site. All landfill sites are subject to general criteria, laid down in Annex I. Moreover, Member States had to provide the Commission with a strategy that ensured that by 17 July 2006, biodegradable municipal waste going to landfill was reduced to 75% of the total amount (by weight) of such waste produced in 1995; by 17 July 2009, this figure ought to have been brought to 50%; and by 17 July 2016, it must be 35%.[16] The figures may be amended by the Council along the way.

In accordance with Article 16 of and Annex II to Directive 1999/31, the Commission had to establish detailed criteria and/or test methods, as well as accompanying quality standards for each type of landfill. The adoption of these criteria was crucial as a benchmark for the implementation of the Directive. However, it took longer than expected to have them complete the legislative cycle. The final decision was adopted in December 2002 and published early 2003.[17] The Decision amounts to strict criteria for leakage, while leaving Member States quite a bit of room for stricter criteria.

In conclusion, the overt aim of the Directive is not to ban landfill altogether, nor to make this practice fade away over a 20-year period. Yet, it clearly implicates that alternative waste treatment techniques will have to be sought for at least part of the waste that now goes to landfill, this also having an immediate impact on climate mitigation. The most likely alternative is incineration with energy recovery (if the waste concerned is not recycled or composted according to the waste hierarchy expounded by Article 4(1) of the WFD of 2008). A ban on the landfill of biodegradable waste is not included in the Directive, although it continues to be periodically mooted by the EC. Some Member States have introduced qualified bans on biodegradable waste.[18]

[13] Article 18(1) Directive 1999/31.
[14] By Regulation 1882/2003 ([2003] OJ L 284) and Regulation 1137/2008 ([2008] OJ L 311); both on Article(s) 16 and/or 17 Directive 1999/31 concerning the assisting Committee.
[15] Article 4 jo. Article 2(c)(d)(e) Directive 1999/31.
[16] Article 5(1)(2) Directive 1999/31. These targets are considerably different (expanded) than originally proposed by the Commission. All the more since the reference year has been changed into 1995 instead of 1993. Furthermore, the strategy for the implementation of the reduction of biodegradable waste going to landfills, as defined in Article 5 Directive 1999/31, shall be taken into account when creating waste management plans, according to Recital (37) of the Waste Framework Directive, 2008/98.
[17] Council Decision 2003/33 [2003] OJ L11/27. Also called the 'WAC Decision' and entered into force on 16 July 2004. Limit values had to be applied as of 16 July 2005.
[18] See in general European Environment Agency, *Diverting Waste from Landfill*, July 2009, available at http://goo.gl/kSsBYt last consulted 22 November 2013.

3. The application of the waste framework Directive to waste incineration with energy recovery

The qualification 'recovery' v 'disposal' is very relevant. Recovery of waste evidently leads to different conditions in permit requirements. It also leads to much reduced scope for Member States to refuse the im- or export of wastes (as opposed to those destined for disposal, where the authorities have much more leeway). Incineration of waste with energy recovery was for some time considered to be an optimal solution to addressing both the environmental concerns associated with municipal and industrial waste, and to help address the geopolitical concerns related to security of supply in Europe's energy policy.

3.1 Prelude: Court of Justice case-law

The Court of Justice considered the qualification of waste incineration as 'recovery' under the waste framework Directive on three main occasions.[19]

1. In Case C-228/00 *Commission v Germany*,[20] the EC had received complaints, in particular from Belgian cement kilns, that Germany's criteria for distinguishing disposal from recovery in the case of incineration of waste (no precise criteria had been laid down at Union level) were unacceptable. The Court did not in principle oppose this right of the Member States, provided these criteria do not infringe upon the meaning of 'recovery' within the framework Directive. *In casu*, the Court held that the use of waste as fuel in cement kilns was a recovery operation, on the basis inter alia of the abstract concept of 'recovery' of waste which it had defined in ASA[21] as meaning that the essential characteristic of a waste recovery operation is that the waste serve a useful purpose in replacing other materials which would have had to be used for that purpose, thereby conserving natural resources. The Court of Justice

> (i) put forward three cumulative conditions for the incineration of waste to be classified as a recovery operation. The main purpose of the operation concerned is to enable the waste to be used as a means of generating energy. This implies:
>
> – condition 1: the energy generated by, and recovered from, combustion of the waste is greater than the amount of energy consumed during the combustion process;
>
> – condition 2: part of the surplus energy generated during combustion should effectively be used, either immediately in the form of the heat produced by incineration or, after processing, in the form of electricity;
>
> – condition 3: the waste must be used principally as a fuel or other means of generating energy, which means that the greater part of the waste must be consumed during the operation and the greater part of the energy generated must be recovered and used.

19 More extensive analysis of all three in G. VAN CALSTER 'Waste incineration cases spark heated debate on waste management priorities', *Review of European Community and International Environmental Law (RECIEL),* 2003, 340-344.

20 [2003] ECR I-1439.

21 Case C-6/00 *Abfall Service AG (ASA) v Bundesminster fur Umwelt, Jugend und Familie* [2002] ECR I-1961.

(ii) dismissed the relevance of other criteria, in particular the calorific value of the waste, the amount of harmful substances contained in the incinerated waste, and whether or not the waste has been mixed. These were all criteria, which Germany had put forward, but which were not relied on by the Court. They were however later inserted in the amended waste framework Directive (see below).

A similar issue with respect to the calorific value of wastes was explored in *Commission v The Netherlands*,[22] in which the Commission took issue with the Dutch practice systematically to oppose shipments where the value of recovery in the receiving state is lower than in the state of dispatch. The Court sided with the Commission.

2. In Case C-116/01 SITA EcoService Nederland (previously Verol Recycling Limburg) v VROM,[23] the waste at issue was to be used by the Belgium cement industry as fuel in cement kilns and as raw material in the production of clinker by cement factories. In that CHP process, the energy produced from the waste replaces energy produced by raw materials, and ash from incinerated waste, in turn, replaces raw materials. The Court of Justice emphasised a point which it had already made in *Commission v Germany*, namely that calorific value is not relevant for the purpose of establishing recovery. Next, it held that to be considered use principally as a fuel or other means to generate energy, within the meaning of point R1 of Annex II B to the Directive, it is both necessary and sufficient that the combustion of waste meet the three conditions set out in paragraphs 41 to 43 of *Commission v Germany*.

3. Finally, in Case C-458/00 Commission v Luxembourg,[24] waste, which came from two waste producers in Luxembourg, was to be recovered by incineration in the Municipality of Strasbourg. The Court confirmed the three conditions of *Commission v Germany* and held that these were not met in casu by the shipment concerned. The Court stated:

> *The shipment of waste in order for it to be incinerated in a processing plant designed to dispose of waste cannot be regarded as having the recovery [of] waste as its principal objective, even if when that waste is incinerated[,] all or part of the heat produced by the combustion is reclaimed … Where the reclamation of the heat generated by the combustion constitutes only a secondary effect of an operation whose principal objective is the disposal of waste, it cannot affect the classification of that operation as a disposal operation [even if] such reclamation of energy is in accordance with the Directive's objective of conserving natural resources.*

The core of the Court's decision in *Commission v Germany* is that the use of waste as a fuel in a cement kiln is a recovery operation. The core of the Court's decision in *Commission v Luxembourg* is that the incineration of household waste may constitute 'recovery', provided the incineration fulfils the *ASA* test. In particular, the Court found that the Commission had failed to show that the waste at issue replaced the use of a source of primary energy, which would have been used to fulfil the function. To the extent that municipal waste incineration facilities have been purposely built merely to incinerate waste, and that they would not be employing another source of energy were it not for the domestic waste, the activities carried out by such facilities are disposal operations, not recovery operations.

22 Case C-113/02 *Commission v The Netherlands* [2004] ECR I-9707.
23 [2003] ECR I-2969.
24 [2003] ECR 1553.

The judgments do not say that waste incineration is a disposal operation, regardless of whether energy is recovered: *Commission v Germany* is a case in point. Neither do they say that municipal or household waste destined for incineration is automatically to be regarded as a disposal operation (as opposed to incineration of non-municipal waste).

It is noteworthy that in the recent *Gävle Kraftvärme* case,[25] the Court, within the more specific context of the waste incineration Directive, sought to downplay the relevance of the original purpose for which a plant is built, with a view to deciding whether it is an incineration or a co-incineration plant (which is relevant for the obligations under the waste incineration Directive). In *Lahti Energia Oy*[26] the ECJ further decided on the criteria for the qualification of a plant as being an 'incineration' or a 'co-incineration' unit. The Court held that in the case of a power plant which uses as an additional fuel, in substitution for fossil fuels used for the most part in its production activities, gas obtained in a gas plant following thermal treatment of waste, must be regarded, jointly with that gas plant, as a "co-incineration plant", when the gas in question has not been purified within the gas plant. The Court instructed the national authorities to take account of the specific circumstances of the plants in question, in particular the volume of energy generated or material products produced in relation to the quantity of waste incinerated in the plant in question and the stability or continuity of that production.

3.2 The current provision in the waste framework Directive

The Court of Justice's case-law led to intensive debate in the run-up to the new Waste Framework Directive, Directive 2008/98.[27] Annex II (Recovery operations) includes category R1 'Use principally as a fuel or other means to generate energy', with in footnote the following specification:

> *This includes incineration facilities dedicated to the processing of municipal solid waste only where their energy efficiency is equal to or above:*
> *- 0,60 for installations in operation and permitted in accordance with applicable Community legislation before 1 January 2009,*
> *- 0,65 for installations permitted after 31 December 2008,using the following formula: Energy efficiency = (Ep - (Ef + Ei))/(0,97 × (Ew + Ef))In which:*
> *- Ep means annual energy produced as heat or electricity. It is calculated with energy in the form of electricity being multiplied by 2,6 and heat produced for commercial use multiplied by 1,1 (GJ/year)*
> *- Ef means annual energy input to the system from fuels contributing to the production of steam (GJ/year)*
> *- Ew means annual energy contained in the treated waste calculated using the net calorific value of the waste (GJ/year)*
> *- Ei means annual energy imported excluding Ew and Ef (GJ/year)*
> *- 0,97 is a factor accounting for energy losses due to bottom ash and radiation. This formula shall be applied in accordance with the reference document on Best Available Techniques for waste incineration.*

25 Case C-251/07 *Gävle Kraftvärme AB v Länsstyrelsen i Gävleborgs län*, [2008] ECR I-7047.
26 Case C-317/07 *Lahti Energia Oy,* [2010] ECR I-1429.
27 OJ [2008] L312/3.

The Commission issued a guidance document[28] for the interpretation of this formula which, inter alia, provides that it is not only an expression of efficiency in physics, but also a performance indicator for the level of recovery of energy from waste in a plant dedicated to the incineration of municipal solid waste. The document further states that the practical impact of this provision has to be monitored in future and the R1 formula may be revised in 2014, in accordance with the provisions of article 37(4) of the new Directive (if necessary to keep it up to date with the technological progress). It also explains the development of the formula and its link to the Integrated Pollution Prevention and Control Reference Document on the Best Available Techniques for Waste Incineration.

4. Waste incineration[29]

What started off as a proposal to integrate the two existing regimes on the incineration of waste[30] subsequently was redrafted to also integrate the Directive on the incineration of hazardous waste.[31] Directive 2000/76[32] eventually replaced the three Directives which previously co-existed on this issue.

It is fair to say that climate mitigation was not the most pressing concern in the negotiation of the Directive. However in the meantime the climate impact of waste incineration facilities (quite aside from their impact on the use of waste as a source of energy – see above) has become clearer, or perhaps the EC is more in touch with data on these impacts. The incineration of municipal waste involves the generation of climate-relevant emissions. These are mainly emissions of CO2 (carbon dioxide) as well as N2O (nitrous oxide), NOx (oxides of nitrogen) NH3 (ammonia) and organic C, measured as total carbon. CH4 (methane) is not generated in waste incineration during normal operation.[33] Depending on the Member State, the share of incineration in waste management is quite considerable, ranging from 95% in Luxemburg, via Denmark's 75%, to 0% in Greece.[34]
In contrast with the pre-existing regime, domestic waste is now subject to the Directive. This indeed was one of the very reasons for reviewing the Directives. Likewise in contrast with the previous regime, the text now applies to incineration and co-incineration alike – including waste co-incineration facilities. Cement kilns which use waste for co-incineration are subject to stricter rules than originally envisaged by the Member States—this is a quid pro quo for the Parliament's flexibility on the PVC issue.[35]

---

[28] Guidelines on the interpretation of the R1 energy efficiency formula for incineration facilities dedicated to the processing of municipal solid waste according to Annex II of Directive 2008/98, available at http://ec.europa.eu/environment/waste/framework/pdf/guidance.pdf , last consulted 22 November 2013.
[29] This section with Raluca Radu and Thomas de Römph.
[30] Proposal of 7 October 1998 for a Council Directive on the incineration of waste [1998] OJ C372/11, doing away with the two existing regimes on the incineration of municipal waste, one for new, and one for old plants.
[31] Directive 94/67, [1994] OJ L365/34.
[32] Directive 2000/76, [2000] OJ L332/91.
[33] Johnke, B., 'Emissions from waste incineration', in *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, Intergovernmental Panel on Climate Change, 1 May 2000, available via http://www.ipcc-nggip.iges.or.jp/public/gp/bgp/5_3_Waste_Incineration.pdf or http://goo.gl/nqAPL , last accessed 22 November 2013.
[34] Ibidem.
[35] Parliament had proposed specific, strict standards for instance for the incineration of waste with high HOS contents (halogenated organic substances), which in practice targeted PVC. Should this route

The Directive will be repealed with effect from 7 January 2014 by the new Directive on industrial emissions (integrated pollution prevention and control - IPPC), adopted in 2010.[36] As far as waste incineration and co-incineration facilities are concerned, the new Directive does not bring any substantial changes — neither did climate change considerations feature much in the preparation of the Directive. The relevant part of the current Directive has been inserted in Chapter VI called "Special provisions for waste incineration plants and waste co-incineration plants" while the Annexes were consolidated in Annex VI of the new Directive. The legal texts were rearranged in a more logical way, some explanations of the old provisions were provided in greater detail and the definitions were brought in line with the newly adopted waste legislation on waste and hazardous waste.

5. Carbon Capture Storage and European waste law

Directive 2009/31 on the geological storage of carbon dioxide,[37] amended the waste Framework Directive (then Directive 2006/12[38]) as well as the Waste Shipments Regulation.[39] The aim was to exempt CCS from the ordinary waste management regime. This exemption was justified on the basis of the CCS Directive ensuring a high level of protection of the environment and human health from the risks posed by the geological storage of CO2.[40]

The Directive includes in its CO2 stream acceptance criteria, the requirement (Article 12(1)) that

> *A CO2 stream shall consist overwhelmingly of carbon dioxide. To this end, no waste or other matter may be added for the purpose of disposing of that waste or other matter. However, a CO 2 stream may contain incidental associated substances from the source, capture or injection process and trace substances added to assist in monitoring and verifying CO2 migration. Concentrations of all incidental and added substances shall be below levels that would:*
> *(a) adversely affect the integrity of the storage site or the relevant transport infrastructure;*
> *(b) pose a significant risk to the environment or human health; or*
> *(c) breach the requirements of applicable Community legislation.*

---

have been followed, PVC reportedly would have to be taken out of the general domestic waste stream. However this was not accepted in the conciliation meetings — Parliament gave in, in that the obligatory increase in incineration temperature to 1,100 Celsius (compared to the general 850 degrees) is only required for hazardous wastes with a high HAS content, thus excluding PVC.

[36] Directive 2010/75 on industrial emissions (integrated pollution prevention and control) (Recast), [2010] OJ L 334.

[37] OJ [2009] L140/114.

[38] OJ [2006] L114/9. The amendment changed Article 2(1)(a) of the waste framework Directive as follows: [*The following shall be excluded from the scope of this Directive*]: *'"(a) gaseous effluents emitted into the atmosphere and carbon dioxide captured and transported for the purposes of geological storage and geologically stored in accordance with Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide [] or excluded from the scope of that Directive pursuant to its Article 2(2)* [emphasis added; the underlined text is new].

[39] Regulation 1013/2006, OJ [2006] L190/1. The amendment changed Article 1(3)(h) of the Regulation as follows: [*The following shall be excluded from the scope of this Regulation*]: *(h) shipments of CO2 for the purposes of geological storage in accordance with Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide []* [emphasis added; the underlined text is new].

[40] Ibidem, recital 46.

> *2. The Commission shall, if appropriate, adopt guidelines to help identify the conditions applicable on a case by case basis for respecting the criteria laid down in paragraph 1.*

A register needs to be kept of the quantities and properties of the CO2 streams delivered and injected, including the composition of those streams. Member States have to take the appropriate risk management measures. The facility's permit needs to detail requirements on storage of the CO2 concerned.

Crucially, the amendments to the codified Waste Framework Directive 2006/12, were *not* carried over into the currently applicable waste framework Directive, Directive 2008/98.[41] This Directive simply reiterates the previously applicable exception with respect to air emissions: '(*a) gaseous effluents emitted into the atmosphere*'.

The preparatory works of the new framework Directive reveal no trace of discussions on CCS. It is quite tempting to suggest that this is simply a slip of the editorial process and a result of the more or less simultaneous treatment of the CCS Directive and the new waste framework Directive in the EU Institutions.[42] However this in my view is quite a perilous suggestion. It would be much preferable to amend Directive 2008/98 to solidify the exemption.

Of note is that in the face of this uncertainty, one could argue that the CCS Directive is a Directive within the meaning of Article 2(4) of the Waste Framework Directive:

> *4. Specific rules for particular instances, or supplementing those of this Directive, on the management of particular categories of waste, may be laid down by means of individual Directives.*

This route however does not exempt the substances regulated in such specific Directive, from the overall framework Directive. It simply provides for lex specialis and leaves the remainder of the Directive untouched.

6. Conclusion

There are a number of specific anchors in waste management law with an important impact on climate change mitigation. These have been reviewed above. As so often in environmental law, however, the main drivers for (lack of) progress on climate change law, lie elsewhere: in recourses management; waste prevention; internalisation of environmental costs in all sources of energy and transport; etc.

[41] OJ [2008] L312/3.
[42] The CCS Directive was adopted in December 2008, the new waste framework Directive in November 2008.